The focus of annihilation was the new crater, midway between the sea and the peak of Mont Pelée, where now exists a new area of active volcanism, with hundreds of fumaroles, or miniature volcanoes.

The new crater is now vomiting black, hot mud, which is falling into the sea. Both craters, the old and new, are active. Mushroom-shaped steam explosions constantly ascend from the old crater, while heavy ash-laden clouds float horizontally from the new crater. The old one ejects steam, smoke, mud, pumice and lapilli, but no molten lava.

The salient topography of the region is unaltered. The destruction of St. Pierre was due to the new crater. The explosion had great superficial force, acting in radial directions, as is evidenced by the dismounting and carrying for yards the guns in the battery on the hill south of St. Pierre and the statue of the Virgin in the same locality, and also by the condition of the ruined houses in St. Pierre.

According to the testimony of some persons, there was an accompanying flame. Others think the incandescent cinders and the force of their ejection were sufficient to cause the destruction. This must be investigated.

On Monday, May 26, Dr. Hill started on horseback from Fort de France for Morne Rouge and Mont Pelée. He reached Morne Rouge safely on May 27, where he succeeded in getting a number of photographs. A close approach to Mont Pelée was impossible, so he started back in a southerly direction. During the two nights he was camping out he made some important observations of volcanic action, and on his return issued the following statement :—

My attempt to examine the crater of Mont Pelée has been futile. I succeeded, however, in getting very close to Morne Rouge. At 7 o'clock on Monday evening I witnessed from a point near the ruins of St. Pierre a frightful explosion from Mont Pelée, and noted the accompanying phenomena. While these eruptions continue no sane man should attempt an ascent to the crater of the volcano. Following the salvos of detonations from the mountain, gigantic mushroom-shaped columns of smoke and cinders ascended into the clear, starlit sky, and then spread in a vast black sheet to the south and directly over my head. Through this sheet, which extended a distance of ten miles from the crater, vivid and awful lightning-like bolts flashed with alarming frequency. They followed distinct paths of ignition, but were different from lightning, in that the bolts were horizontal and not perpendicular. This is indisputable evidence of the explosive oxidation of the gases after they left the crater. This is a most important observation, and it explains in part the awful catastrophe. This phenomenon is entirely new in volcanic history.

I took many photographs, but do not hesitate to acknowledge that I was terrified.

Nearly all the phenomena of these volcanic outbreaks are new to science, and many of them have not yet been explained. The volcano is still intensely active, and I cannot make any predictions as to what it will do.

Associated Press messages from Martinique, dated May 31, announced that Prof. Heilprin had succeeded in climbing to the top of the crater of Mont Pelée. The despatch is as follows :—

Prof. Angelo Heilprin this morning ascended to the top of the crater on the summit of Mont Pelée.

The expedition left Fort de France last Thursday, May 29, at noon. Friday was spent in studying the newly formed craters on the north flank of the mountain. Saturday morning Prof. Heilprin determined to attempt the ascent to the top of the crater, and with this purpose in view he set out at five o'clock.

The volcano was very active, but Prof. Heilprin reached the summit and looked down into the huge crater. Here he spent some time in taking careful observations. He saw a huge cinder cone in the centre of the crater. The opening of the crater itself is a vast crevice 500 feet long and 150 feet wide.

While Prof. Heilprin was on the summit of the volcano, several violent explosions of steam and cinder-laden vapour took place, and again and again his life was in danger. Ashes fell about him in such quantities at times as to obscure his vision completely.

Prof. Heilprin found that the crater at the head of the River Fallaise has synchronous eruptions with the crater at the summit of the volcano, and that it ejects precisely the same matter at such times.

On May 31 a party consisting of Prof. Jaggar, of Harvard University, Dr. Hovey, of the American Museum of Natural History of New York, and Mr. George C. Curtis, ascended to the summit of the Soufrière of St. Vincent from the western side.

The ascent was exceedingly difficult, owing to the mud that covered the mountain side, but the ground was cold. After a tiresome scramble up the slippery hill, the rim of the old crater was reached about midday. There was no trace whatever of vegetation, but there had been no change in the topographical outlines of the mountain on that side, and the old crater retained its tragic beauty. The great mass of water that formerly lay serenely about 500 feet below the rim of the crater had disappeared, and the crater appeared to be a dreadful chasm more than 2000 feet deep. With the aid of a glass, water was made out at the bottom of this abyss.

The party did not venture across the summit of the Soufrière to inspect the new crater, which was then emitting a little vapour, for the ground in that direction looked to be dangerous.

Apparently the ridge of the mountain, called "The Saddle," was intact, although the old crater seemed of larger circumference than before the recent eruption. At the western base of the Soufrière a subsidence of a depth of 100 feet occurred for an area of a square mile. The bank of volcanic dust that prevents the sea encroaching farther inland at Wallibou is being gradually washed away. The lava beds on the eastern side of the Soufrière continue to emit steam, despite the protracted and heavy rainfall that has occurred.

Mr. Knight, Senator for Martinique, has arrived in Paris, and a few of his observations of the condition of men and things in that island are given in yesterday's *Times*. He says that the streams of mud which are still flowing do not emerge from the flanks of the volcano, but from the constantly convulsed ground, now opening in large abysses and then closing. Evidence that the death of the victims of the Mont Pelée eruption must have been instantaneous was obtained from the appearance of the bodies discovered.

Thus, persons have been found on the thresholds of their nearly demolished houses in the attitude of gazing at Mont Pelée. Others were found seated at a table. One man, discovered in the middle of the street, had the muscles of his legs and arms fixed in the attitude of a runner. Others were shaking hands.

PROF. ADOLF FICK.[1]

WITH Adolf Fick, the physiologist of Würzburg, whose death took place in the autumn of last year at Blankenberg, there passed away one of the last representatives of the brilliant physiological school by the combined labours and critical acumen of which, during the latter half of the past century, the foundations of modern physiology were established. For the complete appreciation of the man's whole character, however, regard should be had as well to Adolf Fick's energetic and practical support of public, and, in particular, educational questions, as to his distinction as investigator, man of science and teacher. In all matters that he took in hand he made a striking and original appearance, and he merits a special place in the honour roll of history.

Fick, in whom as a youth conspicuous mathematical talent had already displayed itself, sought the university with the intention of studying mathematics. His elder brother, Heinrich, who died a few years ago while professor of Roman law at Zürich, urged him to the study of medicine, and this he pursued at Marburg and Berlin.

[1] Abridged from an obituary notice by Prof. Kunkel.

At the former university he graduated in September 1851. As early as the year 1852 he worked as prosector under C. Ludwig, whose close friendship he retained throughout life.

In 1856 he went into residence at Zürich, and, in succession to Ludwig and Moleschott, obtained in 1862 the full professorship of physiology there. which he retained for six years. In the year 1868, upon Von Bezold's early death, Fick was called to Würzburg, where he filled the chair of physiology for thirty-one years. He resigned his post at the end of the summer term of 1899, not from distaste for work or through the burden of years, but while in full vigour of mind and body, in the strict fulfilment of a long-expressed intention of making way, on the completion of his seventieth year of life, for the energies of a younger man.

At the time when Fick entered upon the study of physiology, modern medicine, as it is now understood and taught in the schools, was still in its infancy. The great strides made by chemistry at the beginning of last century had rendered possible the introduction of exact methods in the investigation of the problems of biology. The first positions securely gained by physical science had been at once utilised to set aside the doctrine of "vital power," and to establish the important principle that we must endeavour to explain the specific phenomena of life as being determined by preceding chemical and physical conditions. Just as the chemists Lavoisier, Liebig and others, with the knowledge that they had won by their special training, addressed themselves at once to the solution of biological questions, so a school of physicists, starting from the basis of its own discoveries, proceeded to the investigation of the physiological problems which appertained to it. The brothers Ernst, Heinrich and Eduard Weber, Helmholtz, Du Bois-Reymond, Ludwig, Brücke, are the most prominent names of this school and already belong to history, and amongst these earlier adaptors of the methods of physical research to the study of biology, Fick must be accorded a place on account both of his conspicuous bent and training as a physicist and of the work accomplished by him. So early as the year 1849, when a nineteen-year-old student, Fick published his first scientific treatise—that on the muscular system of the thigh—an essay which even at the present day forms a very instructive analysis of the mechanical relations of the muscles of the hip joint. For these researches into the mechanism of the human body Fick always retained a liking. He wrote a monograph on the saddle-shaped articulations, gave in his "Medical Physics," the first edition of which appeared in the year 1856, an admirable exposition of the mechanism of the joints generally, and contributed an article on the subject to L. Hermann's great "Handbuch," besides encouraging several of his own pupils to undertake similar investigations.

His scientific work upon the mechanics of the body led Fick to a special line of inquiry—one to which he devoted the working time and energy of his mature years—that respecting the changes of muscle during its contraction. There are about thirty essays by Fick himself, as well as a number of writings by his students, which deal with particular points in the physiology of muscle. Of these one of the most important was the development of heat which attends contraction. With the aid of thermo-electrical apparatus devised by himself, he was enabled to determine approximately the absolute amount of heat that was developed during continuous contraction. He subsequently introduced and defined the important conceptions which are expressed by the terms "isotonic" and "isometric" as applied to contraction, and investigated the nature of the conditions so designated. For the measurement of work, he constructed his "Arbeitssammler."

As the final result of all his muscular studies, he stated his views as to the nature of the process of muscular contraction. These have not escaped criticism. One of his conclusions, however, which in a manner he reached by a process of exclusion in so far as he rendered untenable other possible ways of explaining the contraction of muscle by reference to the second of the laws of the mechanical theory of heat, is, indeed, of quite prime importance.

According to Fick, the kinetic energy generated by chemical reactions in the muscle cannot be accounted for by the hypothesis that the chemical energy consumed is first developed in the form of heat, and this transformed into the coordinated kinetic energy of the contraction. It must rather be supposed that the chemical forces stored up in the muscle are so coordinated that in their transformation into kinetic energy they directly cause the change of form of the muscle; so that we have not to do with a thermodynamic process as in the case of the steam engine, but the chemical energy is converted directly into the coordinated kinetic energy of the contraction. With this notable definition respecting the changes which precede muscular contraction, an important stage is reached in the explanation of the phenomena of contractile substances, and every future discussion of these questions must be referred back to this as a starting point.

Another subject of Fick's repeated investigations was that of the dynamics of the circulation. His first efforts were directed towards improving the methods of obtaining graphic records of the blood-pressure curve, with the result that the manometer and the spring kymograph bearing his name have been adopted into general use. He was the first to analyse by means of an apparatus constructed by him—now called the plethysmograph—and with the greatest clearness and precision, the variations in speed of the flow of blood in artery and vein (Zürich Laboratory Reports, 1868). By means of new methods of investigation and observation he threw valuable light upon the phenomenon of dicrotism and upon the pressure of the blood in the ventricles of the heart and in the great vessels.

Under the head of the physiology of the organs of sense, he paid special attention to the subject of vision. His dissertation "Tractatus de errore optico," &c., Marburg, 1851, deals principally with the phenomena of astigmatism (Helmholtz, "Physiolog. Optik," p. 147). Fick occupied himself repeatedly with speculations as to the explanation of the colour sense. He published a number of critical and experimental studies upon the subject. His last communication to the Society of Medical Physics of Würzburg dealt with Hering's theory of the colour sense. His contributions to the study of the subject of hearing consisted in an experimental investigation upon the mechanism of the tympanum. A paper by Fick, on the sense of touch, is comprised in the volume for 1860 of Moleschott's *Untersuchungen*.

Upon the physiology of the nerve substance Fick published only a few essays. To the issues for the year 1862 and 1864 of the reports of the Vienna Academy and to the E. H. Weber "Festschrift" in the year 1871 he contributed studies upon the sensibility of the spinal chord. The essay upon the different degrees of excitability observable in functionally different parts of the chord deserves special mention.

Of Fick's work on metabolism, and the physiology of the digestive glands, may be mentioned, as particularly well known, the experiment[1] that he made with the

[1] *Vide* the *Philosophical Magazine* for June 1866. The late Sir Edward Frankland regarded this as "one of the most important chemico-physiological experiments ever made" (Frankland's "Experimental Researches," p. 918). Although prevented from accompanying his brother-in-law, Fick, on the expedition, Frankland undertook the experimental determination of certain calorimetrical equivalents required as a basis for the conclusions drawn from the Faulhorn experiment. These, it may be added, had a much wider application, and until replaced by more exact determinations they served for years as the only data on which calculations could be founded.

cooperation of J. Wislicenus for estimating the amount of albumin expended in physical work such as mountain climbing. The result, that the material used in muscular work must be free from nitrogen, was at once generally accepted. The results of investigations on the peptones, upon what becomes of them in the circulation of the blood, on the action of pepsin, and on the value of various nutritive substances, were made public from time to time in lectures for which Fick prepared and demonstrated very numerous and laborious experiments.

The students' manuals which Fick wrote are distinguished by their lucid exposition, clear style and critical discussion. His first book, entitled "Die medicinische Physik," was written when he was in his twenty-seventh year, and passed through three editions. This book at once secured for the young author a place in the front rank of the physiologists of the day. Of the "Kompendium der Physiologie" four editions appeared, the last in the year 1892.

As early as 1862 he published a "Lehrbuch der Anatomie und Physiologie der Sinnesorgane" as part of a larger compilation. To Hermann's "Handbuch," already mentioned, he furnished two elaborate articles on physiological optics.

From the physiological laboratory at Zürich in the year 1869, and from the Würzburg Institute in the years 1873 to 1878, there appeared the "Physiologische Untersuchungen" (four issues). From 1852 and onwards for fourteen years he was one of the contributors to Canstatt's "Jahres bericht" on the literature of physiology.

Of the remarkable talents and training that enabled him, for instance, to deliver experimental lectures on physics during the vacancy of the chair of physics, he also gave evidence by his own productions as investigator and writer in this branch of science. Best known is his work on hydro-diffusion in Poggendorff's *Annals*. The fundamental conceptions of mechanics, and the insight gained into these by means of the mechanical theory of heat, were favourite subjects of his speculation. A brief enumeration must suffice here of the titles of the most characteristic of the treatises that fall under this head, and many of which lie in the borderland between physics and pure philosophy:—

"Ueber die der Mechanik zu Grunde liegenden Anschauungen," "Ueber die Zerstreuung der Energie," "Versuch einer physischen Deutung der kritischen Geschwindigkeit in Weber's Gesetz," "Ueber Druck im innern von Flüssigkeiten." The following treatises belong more to the philosophical side:—"Die Naturkräfte in ihrer Wechselwirkung," "Die Welt als Vorstellung," "Philosophischer Versuch ueber die Wahrscheinlichkeit," "Die stetige Raumerfülling durch Masse," &c.

Even this slight sketch of Fick's literary activity will show how comprehensively he mapped out for himself the sphere of his work and how exhaustively he laboured in it. But he was also unusually well equipped in all other departments of human knowledge. He was extraordinarily learned and well read. In accordance with his own definition of an educated man as one who is capable of taking a comprehensive view of the most characteristic results furnished by the intellectual work of the whole of mankind, Fick studied and mastered a very widely embracing province of knowledge. He was assisted in his efforts by a particularly accurate memory, which he retained unimpaired to the last.

Conspicuous among Fick's talents was his critical faculty. He dealt with the first principles of the science of mechanics in an unusually clear and distinct way, and when a series of novel conceptions was put before him he was able to correctly analyse and estimate them. He was recognised by those who knew him as a scientific critic by vocation. He was aided in his experimental work by great manual dexterity. He prided himself upon belonging to the school of Bunsen, and in the construction of the various instruments which he introduced followed Bunsen's method by himself putting together out of simple materials the first models of new scientific apparatus. It is an interesting fact that Fick warmly espoused the cause of total abstinence, and was himself for the last decade of his life a total abstainer.

NOTES.

M. AMAGAT has been elected a member of the section of physics of the Paris Academy of Sciences, in succession to the late Prof. Cornu.

MR. MARCONI brought forward two interesting pieces of information in his lecture at the Royal Institution last Friday. The first relates to the new form of magnetic detector which he has been employing in place of the coherer. The instrument is found to be more sensitive and trustworthy than the coherer, and gives promise of a great increase in the speed of working. Already a speed of thirty words a minute has been attained, and this may possibly be increased to several hundred. The second point relates to the recent Transatlantic signalling. It seems that on the occasion of Mr. Marconi's journey across the Atlantic in the *Philadelphia*, the signals transmitted during the day failed entirely at a distance of 700 miles, although a message was successfully sent at night more than 1550 miles, and a signal more than 2000 miles. This effect Mr. Marconi suggests may be due to the diselectrification of the aërial wires by the daylight. The difficulty can, however, be got over by the use of greater transmitting power—as is evidenced partly by the fact that the signal received at Newfoundland was transmitted during the daytime. The Canadian station, for the erection of which Mr. Marconi was liberally subsidised by the Canadian Government, will be open shortly for experiments. The rest of the lecture gave an interesting *résumé* of the work already accomplished, but contained nothing which will be new to those who have followed its progress.

THE eighty-third meeting of the Société Helvétique des Sciences Naturelles will be held at Geneva on September 7–10. M. E. Sarasin is the president of the society, M. Marc Micheli and Prof. R. Chodat vice-presidents, M. Maurice Gauthier and M. A. de Candolle secretaries, and M. A. Pictet treasurer. Correspondence referring to the forthcoming meeting should be addressed to M. de Candolle, Cour de St. Pierre, 3, Geneva.

IN accordance with previous announcements, the autumn meeting of the Iron and Steel Institute will be held at Düsseldorf on September 3–4. The directors of the Norddeutscher Lloyd have generously offered to the members attending the meeting complimentary first-class passages, including table, to the number of 250, by the s.s. *Kronprinz Wilhelm*, upon that ship's homeward voyage (from New York) to Bremen, on September 1, from Plymouth. The provisional programme of the meeting is as follows:—On Tuesday, September 2, the members will arrive at Düsseldorf. On September 3 the president, council and members will be received by the civic authorities and by the reception committee in the Municipal Concert Hall (Städtische Tonhalle). A selection of papers will subsequently be read and discussed. In the afternoon a visit will be paid to the Düsseldorf Exhibition, for the purpose of examining the various sections of mining, metallurgy and machinery. In the evening the members and ladies accompanying them will be invited by the Mayor and Corporation of Düsseldorf to a conversazione and concert. On September 4 the morning will be devoted to the reading and discussion of papers, and the afternoon to visits to the exhibition and to works in the immediate vicinity. In the evening the reception committee will entertain the visitors at a banquet.